Clean Hot Water At Low Temperatures

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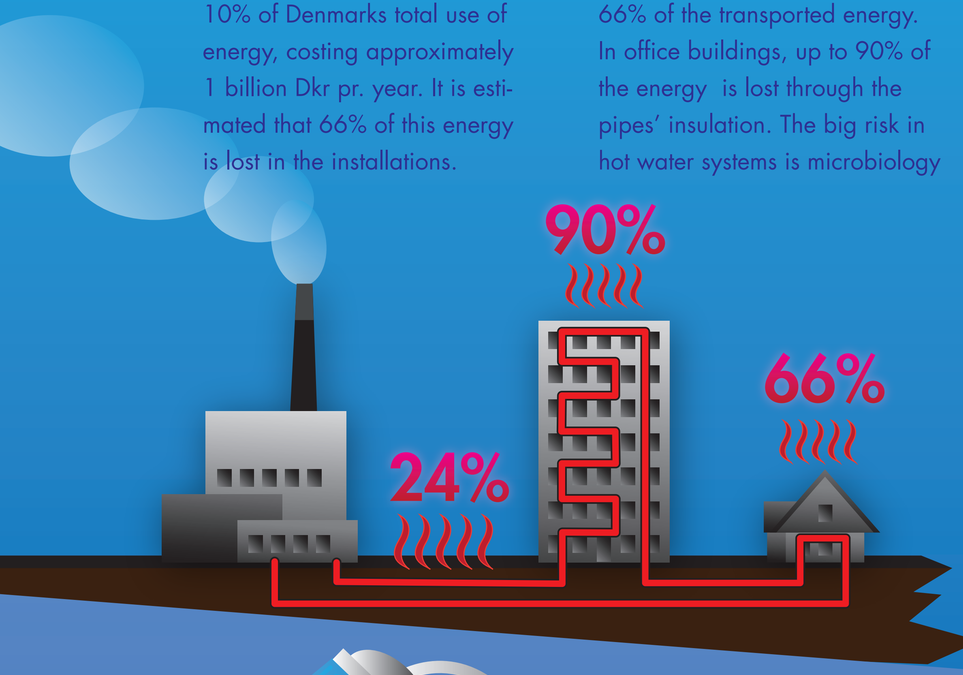
CLEAN HOT WATER AT LOW TEMPERATURES

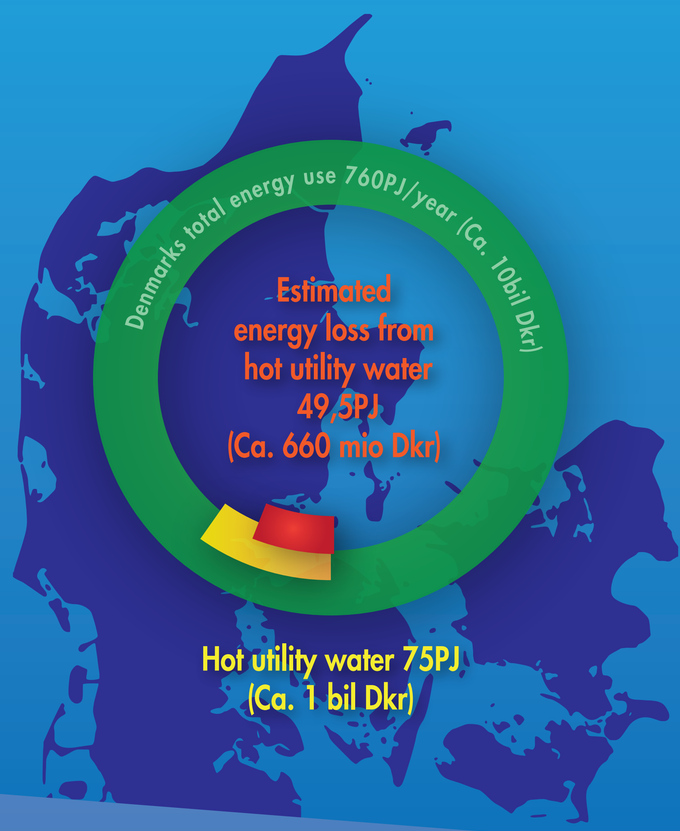
Hot utility water makes up for 10% of Denmarks total use of energy, costing approximately 1 billion Dkr pr. year. It is estimated that 66% of this energy is lost in the installations.

In regular homes the loss is ca. 66% of the transported energy. In office buildings, up to 90% of the energy is lost through the pipes' insulation. The big risk in hot water systems is microbiology and the risk of bacterial growth, which can result in potentially deadly outbraeks of decease (Bøhm et al., 2009).

There is a huge energy potential in lowering the temperature of the district heating systems in Denmark, but to leverage this potential, active meassures to prevent growth of microbiology in the hot water systems must be taken. In the EUDP project "Microbiologically safe reduction of hot water temperature", 6 buildings in Sonderborg has been equipped with a system from the local company Danish Clean Water (DCW). The DCW system injects a small amount of on-the-spot produced mixed oxidant trademarked Neuthox®. Neuthox consists mainly of Hypochlorous acid (HOCl), which is a highly active oxidant that prevents growth of bacteria in the circulation system and removes biofilm entirely.

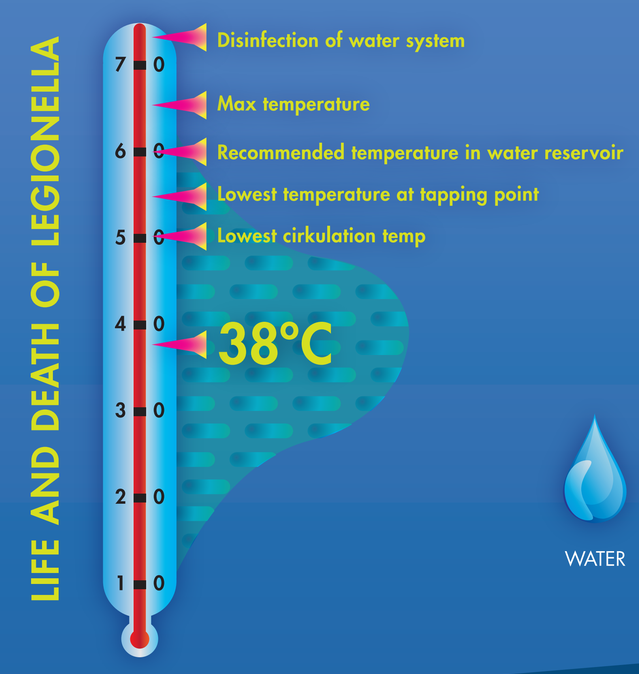
The goal of the project is to prove if the buildings can sustain a minimum level of microbiology in their systems at lower temperatures.





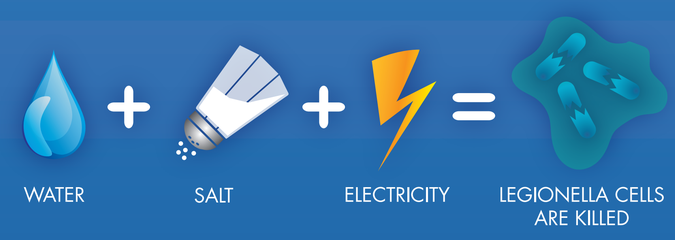
WHY IS THE HOT WATER SO HOT?

The main reason why hot water systems must sustain high temperatures is to prevent microbial growth, especially the Legionella bacteria.
Legionella is a bacteria which occurs naturally in surface water, rivers, lakes, wastewater and drinking water. The bacteria thrives in warm water, which is why it is often found in hot water installations.
Legionella spreads via water particles in the air, and inhalation of the bacteria therefore becomes a risk, when e.g. showering in water that holds the bacteria.
Legionella is known to cause Legionaries' disease or Legion fever, which is a form of pneumonia, and the flu like Pontiac fever (www.danishcleanwater.dk).



A CLEAN SOLUTION

Danish Clean Water provides a system to efficiently eliminate biofilm and control growth of bacteria in hot water systems. A solution of Neuthox® is produced on-site and added in small amounts to the hot water circulation, hereby controlling microbial growth, even at lower temperatures.



PROJECT OVERVIEW

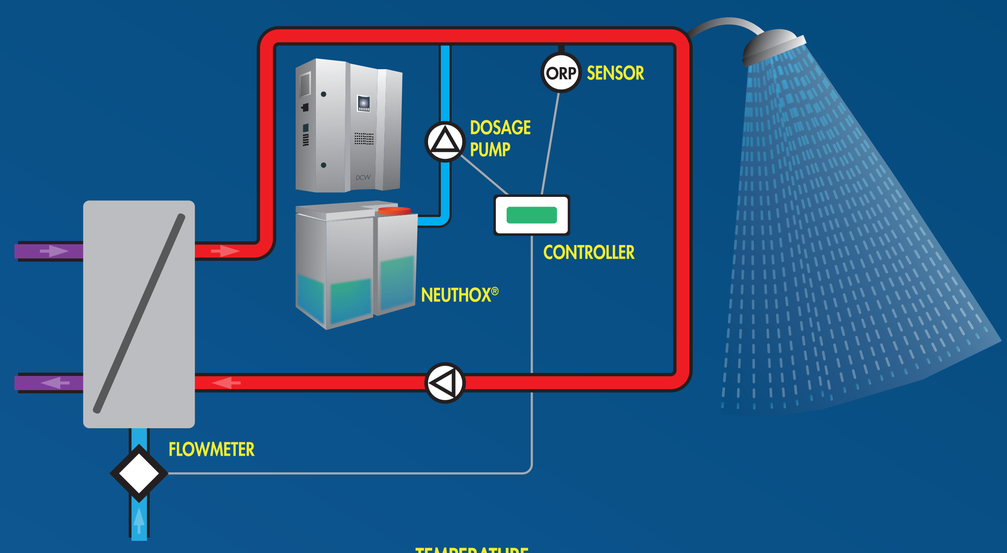
The project involves 6 different buildings in Sonderborg of which 5 have been equipped with a DCW T10 generator.

The project is supported by Teknologisk Institut which continously monitors the different installation sites throughout the project period.

Statens Serum Instutit has approved that the temperature in the different systems is lowered, only when the cirkulations are clean from legionella and the tapping points of the systems has a CFU level below 1000 CFU.

SYSTEM SETUP

By constantly monitoring the hot utility water circulation with an ORP sensor, the controller raises the oxidation level of the water to a level unfavorable for legionella by adding Neuthox® to the circulation.

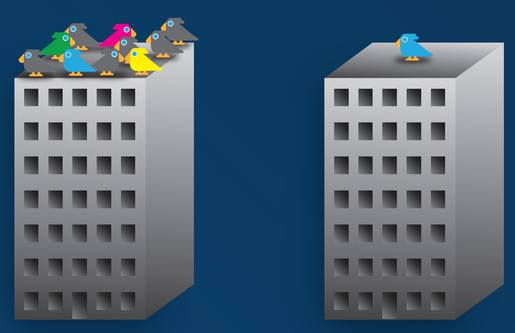


A HUGE POTENTIAL DROP IN IDLE-ENERGY-LOSS

After lowering the temperature, it shows that the level of bacterial growth is still lower than at standard operating temperatures. Hereby, the drop in temperature ΔT has gone from 20°C to 2°C. Overall, this results in a decreased idle-energy-loss of 90%.

In the final period of the project, it will be determined how much energy is actually saved after lowering the temperature at the diffrent sites.

PRELIMINARY RESULTS

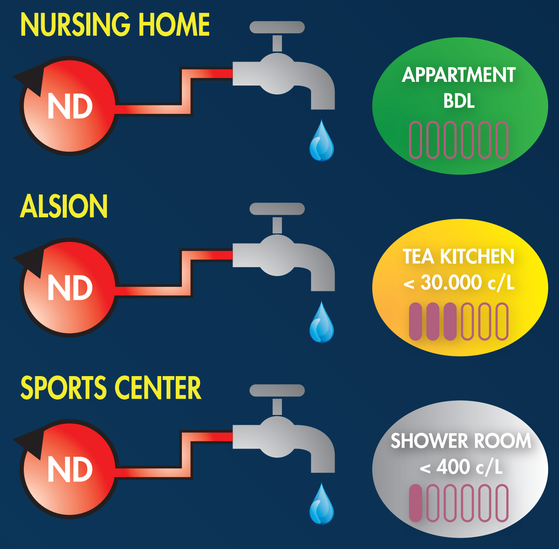


BEFORE
ΔT = 20°C

AFTER
ΔT = 2°C

CONSUMPTION AND FLOW IS CRITICAL TO CONTROL BACTERIAL GROWTH

Results show that there is a clear decrease in bacterial growth over time, also at lower temperatures. In the circulation, the levels are generally Below the Detectable Limit (BDL) or Not Detectable (ND) at all. However, there are still issues in unused ends of the system, where there are long periods without flow. Conventional methods of controlling legionella, e.g. periodically super heating has the same challenge – if the leg is unused the bacteria inside will never be exposed to heat.



Energiteknologisk udvikling og demonstration

Danish Clean Water

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